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(71) Applicant(s)

Rover Group Limited  
(Incorporated in the United Kingdom)  
International Headquarters,  
Warwick Technology Park, WARWICK, CV34 6RG,  
United Kingdom

(72) Inventor(s)

Jason Rowe  
Rue Miguel Azevedo Magalhaes

(74) Agent and/or Address for Service

Bromhead & Co  
19 Buckingham Street, LONDON, WC2N 6EE,  
United Kingdom

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GB 1559291 A EP 0564990 A1 EP 0157640 A2  
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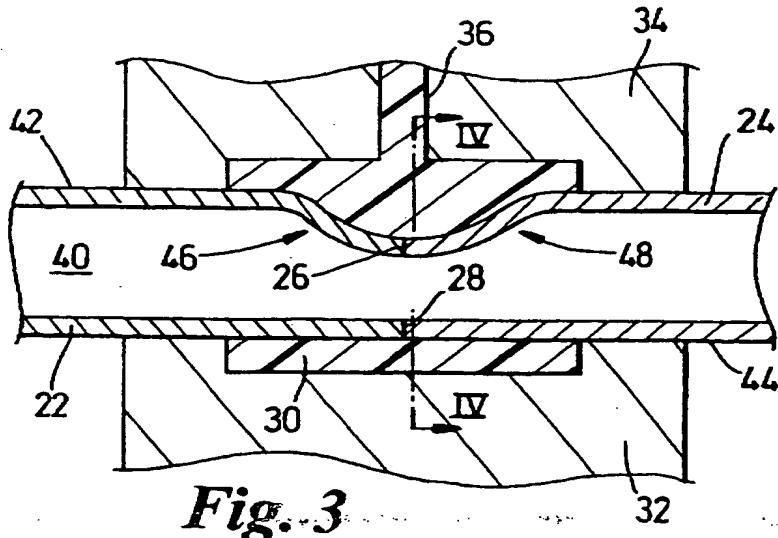
(58) Field of Search

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(54) Abstract Title

A joint for use in the manufacture of motor vehicle spaceframes

(57) A joint between a first tubular member 22 and a second tubular member 24, where each tubular member has a first end portion 26, 28, comprises a plastics moulding moulded about the first end portions of the first and second tubular members, where one of the first end portions includes a radially deflected region. The first and second tubular members may be placed in an open mould cavity such that their first ends abut, and are not able to move in relation to one another. A sprue 36 may be provided in one of the mould parts to enable a plastics material 30 to be injected into the cavity. The plastics material, which may comprise a thermoplastics material such as polypropylene or nylon, may then flow around the outer surfaces 42, 44 of the first and second tubular members. Once the mould cavity has been filled a pressure due to the plastics material within the mould cavity may be increased. When the pressure reaches a certain level, it may cause parts 46, 48 of the tubular members in the region of the abutted first ends 26, 28 to deform radially inwardly. The tubular members may be in the form of aluminium pipes, such as those used in the manufacture of motor vehicle spaceframes.



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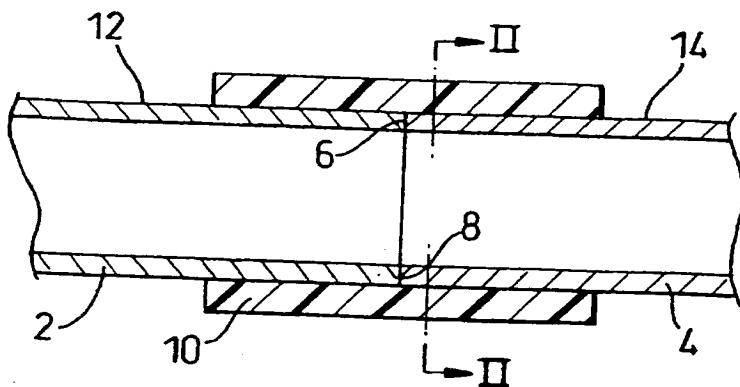


Fig. 1

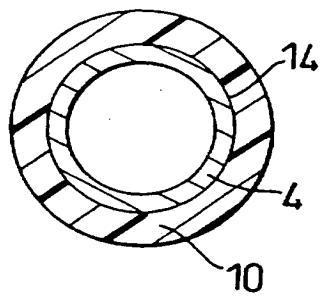


Fig. 2

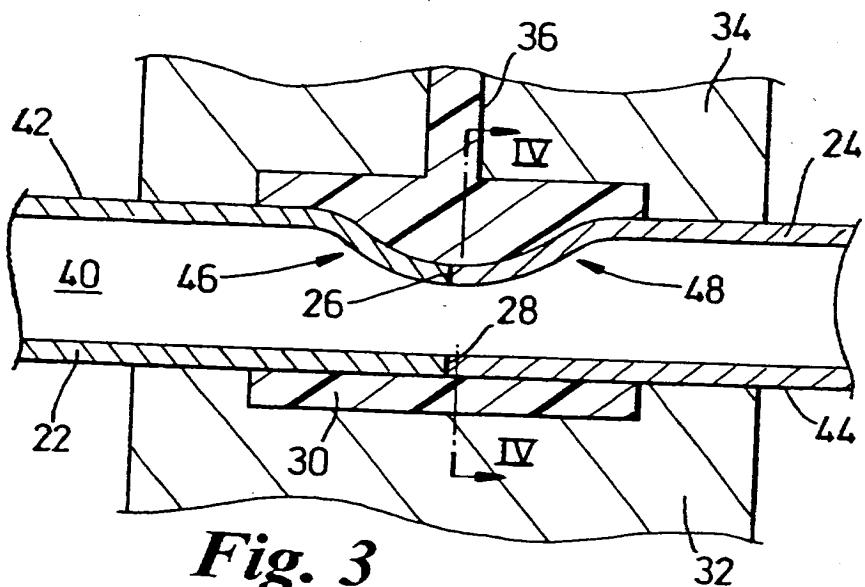


Fig. 3

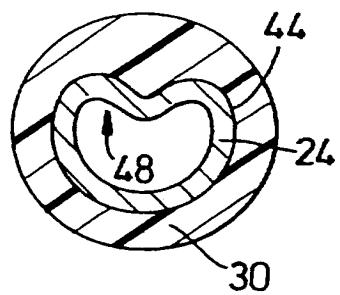


Fig. 4

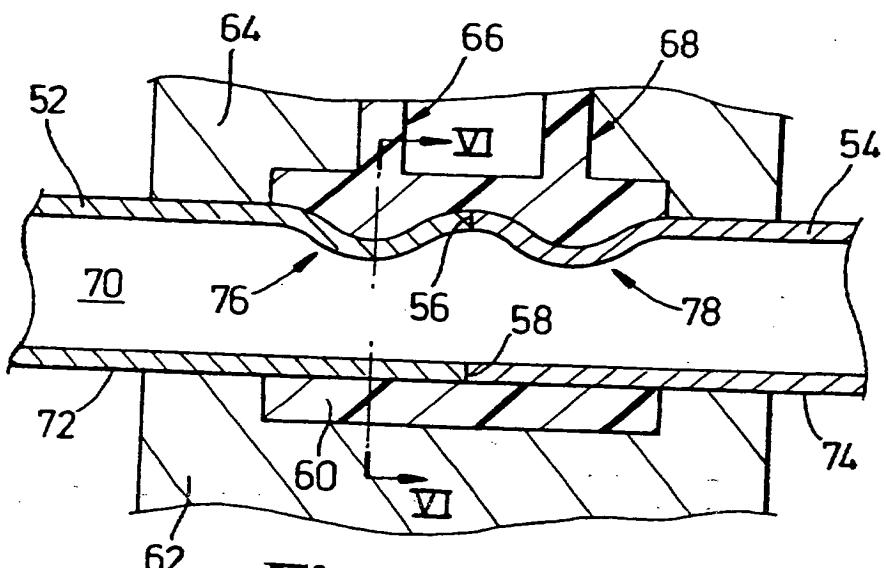


Fig. 5

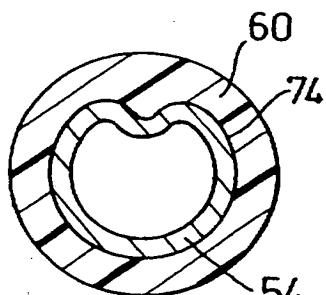


Fig. 6

Assembly

The present invention relates to an assembly, and to a method of manufacturing such an assembly. The assembly has particular, but not exclusive use, in the manufacture of motor vehicle spaceframes.

It is known to form assemblies from tubular members secured to one another at adjacent 5 end portions. The ends may for example be secured together by rivets or by adhesive.

It is also known to join tubular members together by force fitting the adjacent ends of the tubular members into suitable sleeves. However, such joints do not have great resistance to either rotational or tensile forces. It is known to injection mould a plastics casing directly about the adjacent ends of the tubular members. However, without pre-treating the ends of 10 aluminium tubular members there is little natural adhesion between the aluminium tubular members and the plastics of the casing. It will be understood that the need to pre-treat the ends of the tubular members is time consuming step that adds expense to the manufacture of such joints.

According to a first aspect of the present invention, a joint between a first tubular 15 member and a second tubular member, each tubular member having a first end portion, comprises a plastics moulding moulded about adjacent first end portions of the first and second tubular members, characterised in that at least one of the first end portions includes a radially deflected region.

According to a second aspect of the present invention, a method of joining a first tubular 20 member and a second tubular member, each tubular member having a first end portion, comprises the steps of abutting the first end portions of the first and second tubular members within a mould, and injecting a plastics material about the first end portions of the tubular members characterised in that a region of at least one first end portion is deflected radially by the injected plastics material

The invention has as an advantage that the one of the first end portions of the first and second tubular members of the joint having the radially deflected region has an improved resistance to rotational movement due to the mechanical keying or interlocking of the plastics material within the deflected region of the tubular member. In addition, the invention has as 5 an advantage that a joint having a resistance to rotational forces is obtained without the need to pre-treat the ends of the tubular members.

The invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 shows in side section a known joint between a first tubular member and a 10 second tubular member;

Figure 2 shows a section along line II-II of Figure 1 with the sprue plastics omitted;

Figure 3 shows in side section a joint between a first tubular member and a second tubular member in accordance with a first embodiment of the present invention;

Figure 4 shows a section along line IV-IV of Figure 3 with the sprue plastics omitted;

15 Figure 5 shows in side section a joint between a first tubular member and a second tubular member in accordance with a second embodiment of the present invention; and

Figure 6 shows a section along line VI-VI of Figure 5 with the sprue plastics omitted.

Referring first to Figure 1 there may be seen a known joint between a first tubular member 2 and a second tubular member 4. The first tubular member 2 is shown having a 20 first end 6. The second tubular member 4 is shown having a first end 8. The first end 6 of the first tubular member 2 is placed in an open mould cavity (not shown) such that it abuts the first end 8 of the second tubular member 4. The first and second members 2,4 are secured in position such that they are not able to move in relation to one another once the mould cavity has been closed.

25 A plastics material 10 is then introduced into the mould cavity around outer surfaces of the first and second tubular members 2,4 such that the plastics material is in intimate contact

with outer surfaces 12,14 of the first and second tubular members. Since the first ends 6,8 of the first and second tubular members 2,4 abut one another, there is no ingress of the plastics material 10 between the first and second tubular members.

The plastics material 10 is allowed to solidify and the mould cavity opened to allow the 5 removal of the joined first and second tubular members 2,4. However, it is a disadvantage that in the case of untreated tubular members, in particular tubular members of aluminium or an aluminium alloy, there is little natural adhesion between the plastics material and the tubular members. In particular, there is insufficient natural adhesion to withstand the torsional or tensile forces applied to such a joint if such a joint were to be used in a motor 10 vehicle spaceframe. To overcome this problem, it has been the practice as noted above to pre-treat the tubular members by flame spraying or chemical treatment.

A first embodiment of a joint in accordance with the present invention is shown in Figures 3 and 4. A first tubular member 22 is shown having a first end 26. A second tubular member 24 is shown having a first end 28. The first end 26 of the first tubular 15 member 22 is placed in a first part 32 of an open mould cavity such that it abuts the first end 28 of the second tubular member 24. The first and second members are secured in position such that they are not able to move in relation to one another once a second or subsequent part 34 of the mould cavity has been moved into position to close the mould cavity.

A sprue 36 is provided in one of the mould parts to enable a plastics material 30 to be 20 introduced into the mould cavity. The sprue 36 is located in a region adjacent to the abutted first ends 26,28 of the first and second tubular members 22,24.

The plastics material 30 is introduced through the first sprue 36 into the mould cavity to flow around outer surfaces 42,44 of the first and second tubular members 22,24 such that the plastics material 30 is in intimate contact with the outer surfaces of the first and second 25 tubular members and fill the mould cavity. Since the first ends 26,28 of the first and second

tubular members abut one another, there is no ingress of the plastics material 30 between the first and second tubular members 22,24.

Once the mould cavity has been filled, a pressure due to the plastics material 30 within the mould cavity increases. When the pressure has reached a certain level, the pressure will 5 cause parts 46,48 of the tubular members in the region of the abutted first ends 26,28 to deform radially inwardly. Surprisingly, it has been found that the first ends 26,28 of the first and second tubular members 22,24 will deform radially inwards together. This means that the injected plastics 30 does not spurt under pressure into an interior space 40 defined within the first and second tubular members 22,24. This produces an improved resistance to 10 rotational movement due to the mechanical keying or interlocking of the plastics material 30 within the deflected region 46,48 of each tubular member 22,24.

Surprisingly, it has been found that the first ends 26,28 of the first and second tubular members 22,24 will deform radially inwards together whether deformation occurs at a region within the mould cavity adjacent to the sprue 36 through which the plastics material is injected 15 or at some other region of the mould cavity, for example at a region of the mould cavity circumferentially spaced from the sprue 36.

A second embodiment of a joint in accordance with the present invention is shown in Figures 5 and 6. A first tubular member 52 is shown having a first end 56. A second tubular member 54 is shown having a first end 58. The first end 56 of the first tubular member is placed in a first part 62 of an open mould cavity such that it abuts the first end 58 of the second tubular member 54. The first and second members are secured in position such 20 that they are not able to move in relation to one another once a second or subsequent part 64 of the mould cavity has been moved into position to close the mould cavity.

A first sprue 66 and a second sprue 68 are provided toward each end of the mould 25 cavity defined by the mould parts to enable a plastics material 60 to be introduced into the

mould cavity at separate locations. The first and second sprues 66,68 may share a common feeder channel (not shown) to ensure that the pressure of the injected plastics material 60 is equal though each sprue. Each of the first and second sprues 66,68 is located in relation to the first and second tubular members 52,54 in a region slightly spaced from the abutted first 5 ends 56,58 of the first and second tubular members.

The plastics material 60 is introduced through the first and second sprues 66,68 into the mould cavity to flow around outer surfaces 72,74 of the first and second tubular members such that the plastics material 60 is in intimate contact with the outer surfaces 72,74 of the first and second tubular members and fills the mould cavity. Since the first ends 56,58 of the 10 first and second tubular members 52,54 abut one another, there is no ingress of the plastics material 60 between the first and second tubular members.

Once the mould cavity has been filled, a pressure due to the plastics material 60 within the mould cavity increases. When the pressure has reached a certain level the pressure will cause regions 76,78 of the tubular members to deform radially inwardly. This results in the 15 formation of a dimple in one or both of the first and second tubular members 52,54. This produces an improved resistance to both rotational and tensile forces applied to the joint due to the mechanical keying or interlocking of the plastics material 60 within the deflected region of the tubular member. As in the example considered above, deformation of the tubular members may occur in regions of the tubular members adjacent to the injection sprues 66,68 20 or in regions circumferentially spaced from the sprues 66,68.

The tubular members may, for example, be formed from aluminium or an aluminium alloy. The tubular member may be formed by an extrusion process. Prior to use in the present invention, those regions of each tubular member that it is intended to deform may be pre-treated to be weaker or less resistant to deflection than other regions of such a tubular 25 member.

The plastics material may be comprise any suitable material. Conveniently a thermoplastic material such as polypropylene or nylon may be used.

CLAIMS

1. A joint between a first tubular member and a second tubular member, each tubular member having a first end portion, comprising a plastics moulding moulded about the first end portions of the first and second tubular members, characterised in that at least one of the first end portions includes a radially deflected region.
2. A joint according to claim 1, characterised in that both of the first end portions include a radially deflected region.
3. A joint according to claim 1 or claim 2, characterised in that the radially deflected region is formed by the plastics moulding.
4. A joint according to any previous claim, characterised in that the plastics moulding comprises a thermoplastics moulding.
5. A joint according to any previous claim, characterised in that the first member, the second member or both having the radially deflected region comprises an extruded member.
6. A joint according to claim 5, characterised in that the extruded member is of aluminium.
7. A joint substantially as described herein with reference to and as illustrated in Figure 1 of the accompanying drawings.
8. A motor vehicle space frame comprising a plurality of tubular members, at least one of the tubular members being joined to another of the tubular members by a joint according to any previous claim.

9. A method of joining a first tubular member and a second tubular member, each tubular member having a first end portion, comprising the steps of abutting the first end portions of the first and second tubular members within a mould, and injecting a plastics material about the end portions of the tubular members characterised in that a region of at least one first end portion is deflected radially by the injected plastics material.
10. A method according to claim 9, characterised in that both of the first end portions include a radially deflected region.
11. A method according to claim 9 or claim 10, characterised in that the region of the at least one first end portion is weakened prior to the step of abutting the end portions of the first and second tubular members within the mould.
12. A method substantially as described herein.



Application No: GB 9912889.4  
Claims searched: 1 to 12

Examiner: Gareth Prothero  
Date of search: 16 November 1999

**Patents Act 1977**  
**Amended Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): F2G (G18E, G24A2, G37); B5A (AB18)

Int Cl (Ed.6): B29C 65/70; F16L 13/10, 13/11, 13/14, 27/107, 27/113, 31/00, 31/02, 33/207, 33/00

Other: Online: WPI, EPODOC, PAJIO

**Documents considered to be relevant:**

Category	Identity of document and relevant passage		Relevant to claims
X	GB 1559291 A	(CAUNNED) see figs, and particularly col 3, lines 55 to 63.	1, 2, 4 & 5
X	EP 0564990 A1	(SAIAG) see abstract, and fig 1.	1, 4 & 5
X	EP 0157640 A2	(RAYCHEM) see especially figs 3 and 8, and p29, paragraph 2 to p3, paragraph 1.	1 to 5
X	US 5568949 A	(ANDRE) see figs 2 and 5, and col 6, lines 40 to 62, and claim 1.	1, 4, 5 & 9

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 Document indicating lack of inventive step if combined with one or more other documents of same category.  
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